

## MODULE ENM1090: FUNDAMENTALS OF RECYCLING

**Level:** Introductory

**Theme:** Management and Conservation

**Prerequisite:** None

**Module Description:** Students examine opportunities to recycle natural and manufactured materials, and they present the results of research on one or more recycling systems.

**Module Parameters:** Access to government-, industry- and/or community-sponsored recycling facilities and systems.

Access to a science laboratory.

Off-campus learning may support the development of knowledge and skills in recycling practices; consultation with the work-site supervisor will ensure that relevant safety considerations are addressed.

See the *Off-Campus Education Guide for Administrators, Counsellors and Teachers* (Alberta Education) for further information regarding off-campus learning.

**Supporting Module:** CTR1210 Personal Safety (Management) [Career Transitions Strand]; recommended for off-campus learning

Students must have a general knowledge of potential hazards and accepted safety practices relevant to specific recycling sites prior to engaging in off-campus learning experiences. See Planning for Instruction in Section C for further information regarding student safety.

### Curriculum and Assessment Standards

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>present a rationale for waste reduction through recycling, and describe trade-offs that occur through the recycling process</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>negotiating and debating the benefits and costs (from both economic and environmental perspectives) of recycling an organic or inorganic material (e.g., rubber, plastic, paper, earth product). Negotiation and debate to address:               <ul style="list-style-type: none"> <li>problems associated with the generation of wastes at local and global levels</li> <li>both small- and large-scale options for waste reduction through reducing, reusing, recycling and recovering.</li> </ul> </li> </ul> <p><i>Assessment Tool</i>  <i>Negotiation and Debate: Introductory Level, ENMNEG-1</i></p> <p><i>Standard</i>  <i>Address criteria in negotiation/debate to a standard of 1 on the rating scale</i></p>	20

**MODULE ENM1090: FUNDAMENTALS OF RECYCLING** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• identify opportunities to recycle organic and inorganic materials, and describe the resulting products that may be developed</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• identifying and locating recycling facilities and systems currently used in Alberta.</li> </ul> <p><i>Assessment Tool</i> <i>Task Checklist for Mapping, ENMMAP</i></p> <p><i>Standard</i> <i>Identify recycling facilities/systems on a map of Alberta to a standard of 1 on the rating scale</i></p> <ul style="list-style-type: none"> <li>• through laboratory and/or field-based investigations, identifying principles of science and technology used in recycling an organic or inorganic material (e.g., glass, metal, cellulose, petrochemical).</li> </ul> <p><i>Assessment Tool</i> <i>Lab Investigations: Introductory Level, ENMLAB-1</i> <i>Observation Checklist for Field-based Investigations, ENMOBS</i></p> <p><i>Standard</i> <i>Conduct lab investigations to a standard of 1 on the rating scale <u>and/or</u> complete all sections of the observation checklist for field-based investigations</i></p> <ul style="list-style-type: none"> <li>• a concept test in which the student demonstrates knowledge of:               <ul style="list-style-type: none"> <li>– recyclable materials (e.g., organic, inorganic)</li> <li>– recycling systems (e.g., cogeneration, methane capture).</li> </ul> </li> </ul> <p><i>Assessment Tool</i> <i>Energy Sources/Applications/Alternatives (Instructor's Manual)</i></p> <p><i>Standard</i> <i>Response indicating 60% mastery</i></p>	<p>50</p>

**MODULE ENM1090: FUNDAMENTALS OF RECYCLING** (continued)

Module Learner Expectations	Assessment Criteria and Conditions	Suggested Emphasis
<p><i>The student will:</i></p> <ul style="list-style-type: none"> <li>• describe one or more recycling systems</li>   <li>• demonstrate basic competencies.</li> </ul>	<p><i>Assessment of student achievement should be based on:</i></p> <ul style="list-style-type: none"> <li>• planning and implementing a home, school or community project for recycling an organic or inorganic material.</li> </ul> <p><i>Assessment Tool</i>  <i>Task Checklist: Planning and Implementing a Recycling Project, ENM1090-1</i></p> <p><i>Standard</i>  <i>Plan and implement the recycling project to a standard of 1 on the rating scale</i></p> <ul style="list-style-type: none"> <li>• completing a research project on one or more recycling systems.</li> </ul> <p><i>Assessment Tool</i>  <i>Research Process: Recycling Systems, ENM1090-2</i></p> <p><i>Standard</i>  <i>Complete all components of research to a standard of 1 on the rating scale</i></p> <ul style="list-style-type: none"> <li>• observations of individual effort and interpersonal interaction during the learning process.</li> </ul> <p><i>Assessment Tool</i>  <i>Basic Competencies Reference Guide and any assessment tools noted above</i></p>	<p>30</p> <p>Integrated throughout</p>

Concept	Specific Learner Expectations	Notes
<p>Principles of Recycling</p>	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• describe societal trends in the consumption of material goods and generation of waste material</li> <li>• research problems and alternatives associated with the disposal of waste materials at local and global levels</li> <li>• explain the four Rs as an environmental hierarchy of options for conserving resources and reducing pollution: <ul style="list-style-type: none"> <li>– reduce</li> <li>– reuse</li> <li>– recycle</li> <li>– recover</li> </ul> </li> </ul>	<p>Gather media articles (or use the Internet). Obtain statistics regarding trends in waste generation at local and global levels.</p> <p>Compare and contrast recycling with reusing a familiar product.</p> <p>Discuss “packaging” as the largest component of waste.</p>

**MODULE ENM1090: FUNDAMENTALS OF RECYCLING (continued)**

Concept	Specific Learner Expectations	Notes
Principles of Recycling (continued)	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• illustrate how recycling involves taking apart a used product and using the material it contains to make a new product</li> <li>• identify potential benefits and costs associated with the recycling of used materials; e.g.:               <ul style="list-style-type: none"> <li>– use of energy and other natural resources</li> <li>– impact on pollution, litter and the environment</li> <li>– cost related to collecting and processing materials</li> </ul> </li> <li>• analyze economic and environmental trade-offs that occur through the recycling of a natural or manufactured material (e.g., rubber, plastic, paper, earth product).</li> </ul>	<p>Identify common examples of recycling in nature.</p> <p>Conduct research on the benefits and costs of a familiar recycling system. Negotiate and debate the trade-offs while assuming the roles of different stakeholder groups.</p> <p>Plan and implement a strategy for recycling a waste product.</p>
Opportunities for Recycling	<ul style="list-style-type: none"> <li>• identify major categories and examples of recyclable materials, and potential products that can be developed from these materials:               <ul style="list-style-type: none"> <li>– organic (e.g., plant material, paper, soil)</li> <li>– inorganic (e.g., glass, metal, petrochemical)</li> </ul> </li> <li>• explain recycling systems that have the potential to reduce energy consumption and/or waste generation; e.g.:               <ul style="list-style-type: none"> <li>– cogeneration</li> <li>– methane capture</li> <li>– use of waste heat</li> </ul> </li> <li>• explain that the viability of a recycling system may depend upon the extent to which revenues from the sale of the recycled product or service offset the costs associated with collecting and processing raw materials</li> <li>• identify and locate recycling facilities and systems currently used in Alberta</li> <li>• identify a strategy for personal involvement in the recycling of an organic or inorganic material (e.g., glass, metal, cellulose, petrochemical).</li> </ul>	<p>Consider opportunities for recycling household items such as:</p> <ul style="list-style-type: none"> <li>• glass jars</li> <li>• scrap metal</li> <li>• tin cans</li> <li>• newspapers</li> <li>• motor oil</li> <li>• waste plant material.</li> </ul> <p>Prepare flow charts/diagrams of these and other recycling systems.</p> <p>Ask a resource person from a local industry to discuss economic factors that impact recycling policies.</p> <p>Locate major recycling facilities/systems on a map of Alberta.</p> <p>Sample community recycling projects are provided in “Somebody... Should Do Something About This!” (a resource binder available from Alberta Energy).</p>

**MODULE ENM1090: FUNDAMENTALS OF RECYCLING** (continued)

Concept	Specific Learner Expectations	Notes
Recycling Systems	<p><i>The student should:</i></p> <ul style="list-style-type: none"> <li>• research the products and/or services provided by an industry involved in recycling</li> <li>• describe inputs to processing within the industry; e.g.:               <ul style="list-style-type: none"> <li>– commodity inputs/raw materials</li> <li>– financial resources</li> <li>– human and natural resources</li> <li>– technology</li> </ul> </li> <li>• explain major stages and steps in recycling the waste material; e.g.:               <ul style="list-style-type: none"> <li>– collecting and sorting</li> <li>– processing/product formation</li> <li>– transportation and storage</li> </ul> </li> <li>• explain techniques used to control quality within the recycling industry; e.g.:               <ul style="list-style-type: none"> <li>– inspection/sorting of raw materials</li> <li>– product quality and uniformity</li> </ul> </li> <li>• describe transportation and storage requirements, and their impact on industry location and recycling costs</li> <li>• identify environmental standards and concerns that affect the recycling industry; e.g.:               <ul style="list-style-type: none"> <li>– water, soil and air quality</li> <li>– use of energy and other resources</li> </ul> </li> <li>• identify and explain current legislation that affects the recycling industry</li> <li>• describe factors that affect the economic viability of recycling; e.g.:               <ul style="list-style-type: none"> <li>– collecting, sorting, processing and transportation costs</li> <li>– potential market for the product or service</li> <li>– relative cost of waste disposal by other means</li> </ul> </li> <li>• compare and contrast the recycling facility with a similar facility operating in another area of Alberta, Canada or the world.</li> </ul>	<p>See the research strategies provided in “Focus on Research.”</p> <p>Conduct research on a local recycling industry; e.g.:</p> <ul style="list-style-type: none"> <li>• Dominion Glass Company (Redcliff)</li> <li>• Papercycle of Alberta (Edmonton)</li> <li>• Ipsco Steel Sales Ltd. (Regina).</li> </ul> <p>Request information on current recycling programs from Alberta Environment (Waste Management Branch).</p> <p>Loan-free films/videos available from the National Film Board of Canada include:</p> <ul style="list-style-type: none"> <li>• <i>Waste Not, Want Not: The Recycling Imperative</i></li> <li>• <i>Renewable Society: The Vital Option.</i></li> </ul> <p>Explore potential linkages with the Legal Studies strand (e.g., modules on environmental law).</p> <p>Compare local, national and international approaches to recycling.</p>

